US008412560B1

(12) **United States Patent**
Masud et al.

(10) **Patent No.: US 8,412,560 B1**
(45) **Date of Patent: Apr. 2, 2013**

(54) **PRICE OPTIMIZATION USING CURRENT OFFERS**

(75) Inventors: **Faisal Masud**, Issaquah, WA (US); **Stacy Saal**, Bellevue, WA (US); **Paul D. Ohlhaut**, Seattle, WA (US); **Josiah P. Olivieri**, Bellevue, WA (US); **Umair Bashir**, Issaquah, WA (US); **Xiao Yu**, Waterloo (CA); **Tao Hu**, Renton, WA (US)

(73) Assignee: **Amazon Technologies, Inc.**, Reno, NV (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 369 days.

(21) Appl. No.: **12/718,032**

(22) Filed: **Mar. 5, 2010**

(51) **Int. Cl.**
G06Q 30/00 (2012.01)

(52) **U.S. Cl.** **705/7.35**

(58) **Field of Classification Search** 705/7.35
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,038,554 A * 3/2000 Vig 705/400
2002/0072958 A1 * 6/2002 Yuyama et al. 705/10
2005/0038717 A1 * 2/2005 McQueen et al. 705/27
2005/0044050 A1 * 2/2005 Hendrickson et al. 705/400
2006/0265259 A1 * 11/2006 Diana et al. 705/7
2007/0130090 A1 * 6/2007 Staib et al. 705/400
2007/0214066 A1 * 9/2007 Harding et al. 705/28
2007/0250403 A1 * 10/2007 Altschuler 705/26
2007/0294123 A1 * 12/2007 Keser et al. 705/10
2008/0004981 A1 * 1/2008 Gopalpur et al. 705/26
2008/0015964 A1 * 1/2008 Shuster ..... 705/36 R

OTHER PUBLICATIONS

DiRusso, David John, An Examination of Price Dispersion in an Online Retail Marketplace, Temple University, Jan. 2010.*

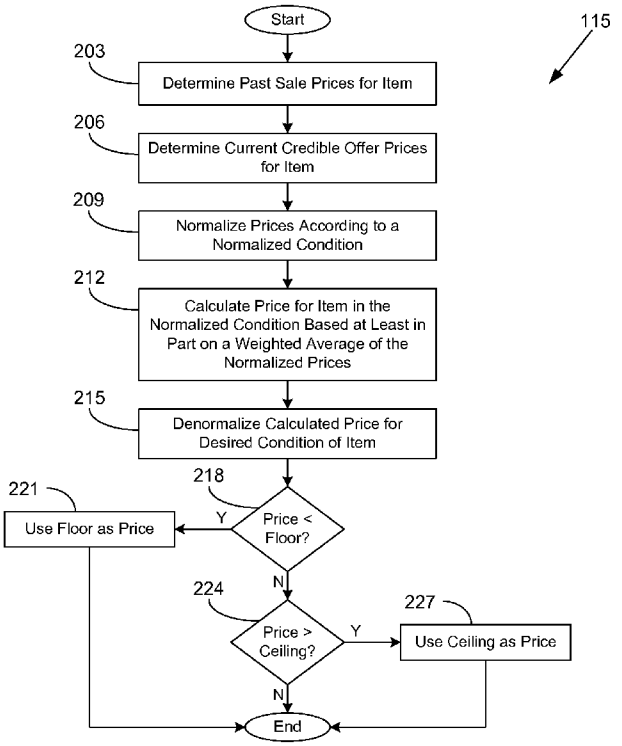
* cited by examiner

Primary Examiner — Nathan Erb
(74) *Attorney, Agent, or Firm* — Thomas | Horstemeyer, LLP

(57) **ABSTRACT**

Disclosed are various embodiments for optimizing prices of items using current offers. Numerous current offers to sell an item are determined from a subset of sellers in an electronic marketplace. Each one of the subset of sellers is associated with a respective reputational score that meets a minimum threshold. A competitive price is generated for the item based at least in part on an average marketplace price determined from the current offers.

26 Claims, 4 Drawing Sheets



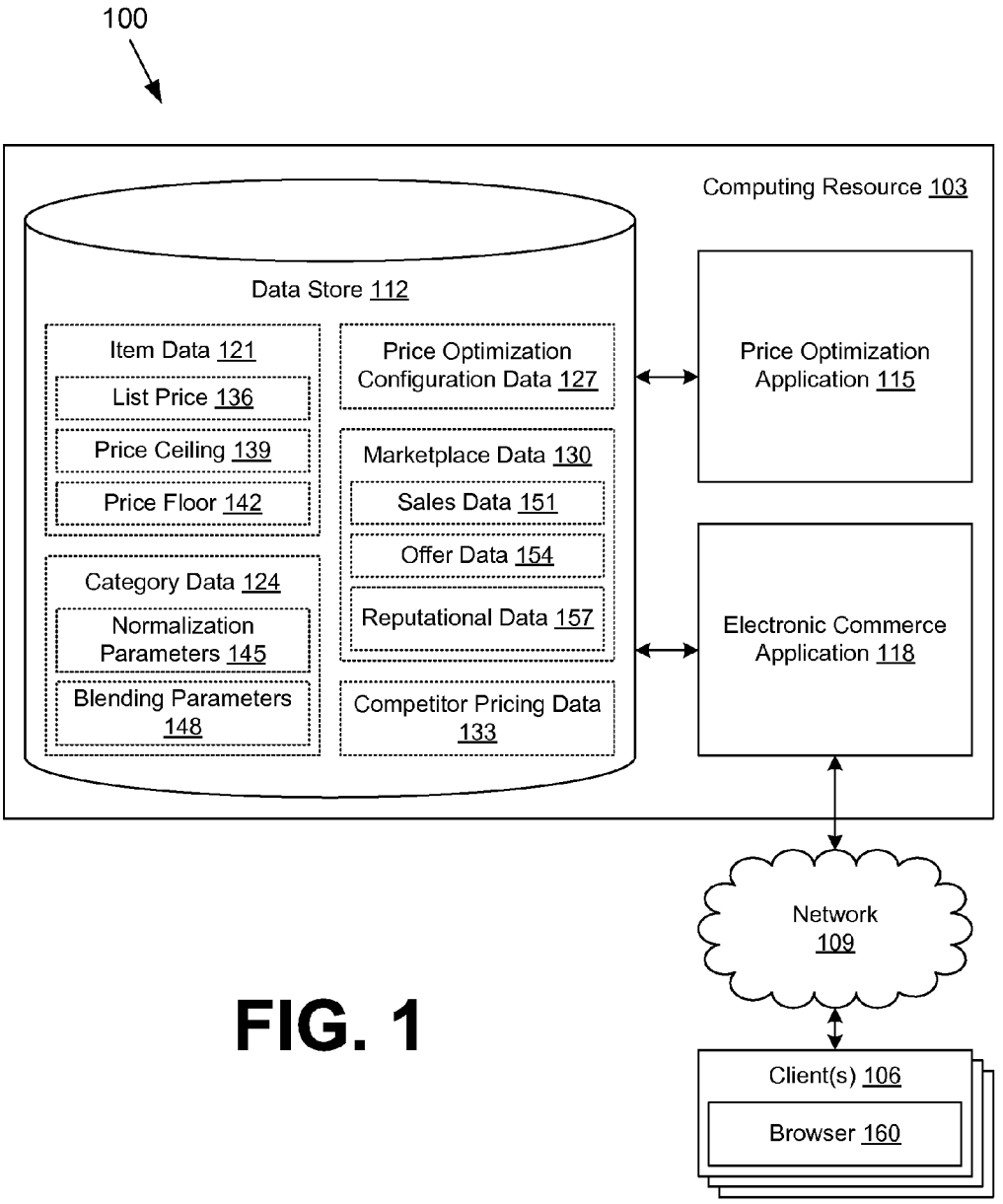

100
Computing Resource 103
Data Store 112
Item Data 121
List Price 136
Price Ceiling 139
Price Floor 142
Category Data 124
Normalization Parameters 145
Blending Parameters 148
Price Optimization Configuration Data 127
Marketplace Data 130
Sales Data 151
Offer Data 154
Reputational Data 157
Competitor Pricing Data 133
Price Optimization Application 115
Electronic Commerce Application 118
Network 109
Client(s) 106
Browser 160

FIG. 1

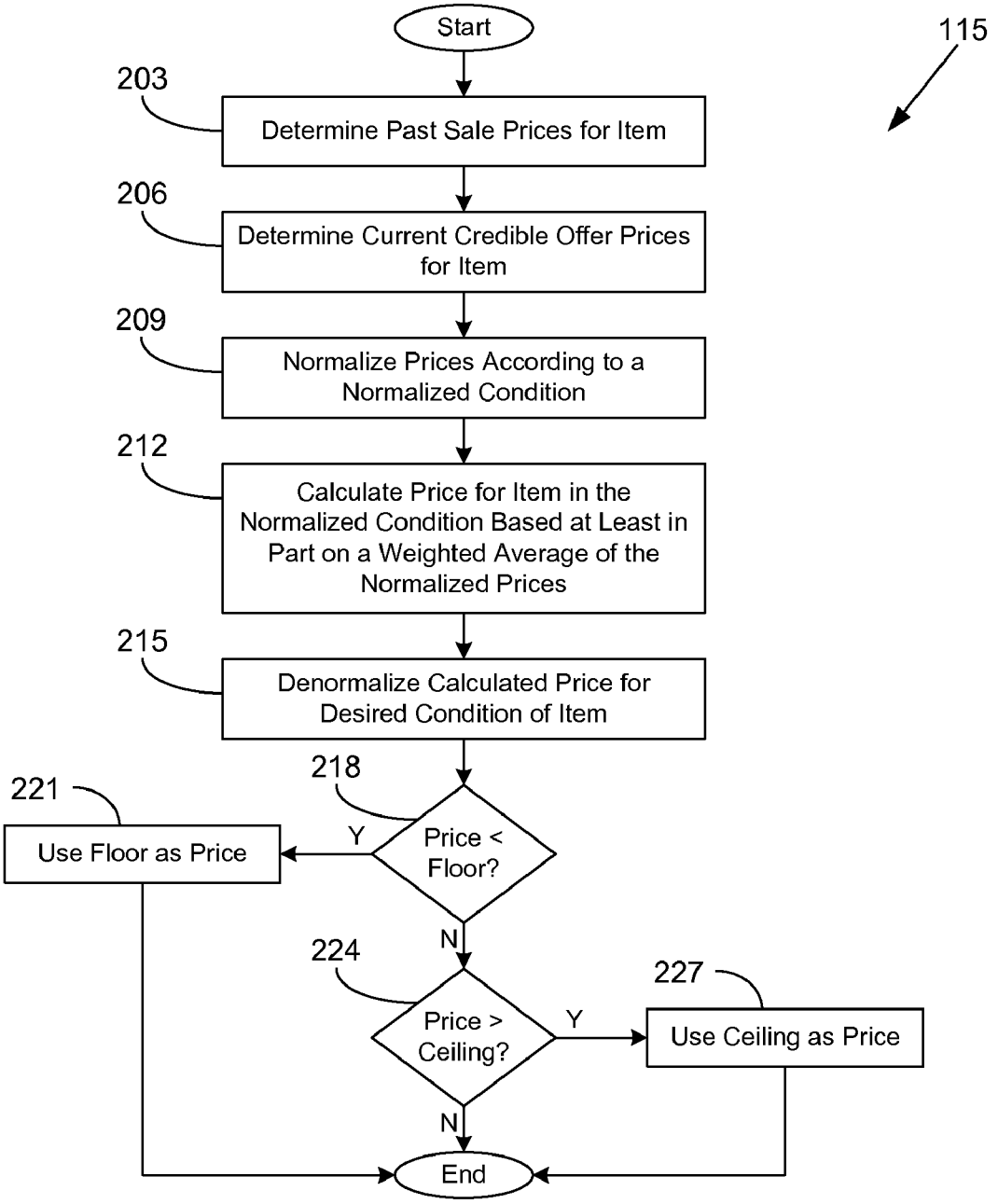

Start
115
203
Determine Past Sale Prices for Item
206
Determine Current Credible Offer Prices for Item
209
Normalize Prices According to a Normalized Condition
212
Calculate Price for Item in the Normalized Condition Based at Least in Part on a Weighted Average of the Normalized Prices
215
Denormalize Calculated Price for Desired Condition of Item
218
Price < Floor?
Y
221
Use Floor as Price
N
224
Price > Ceiling?
Y
227
Use Ceiling as Price
N
End

FIG. 2

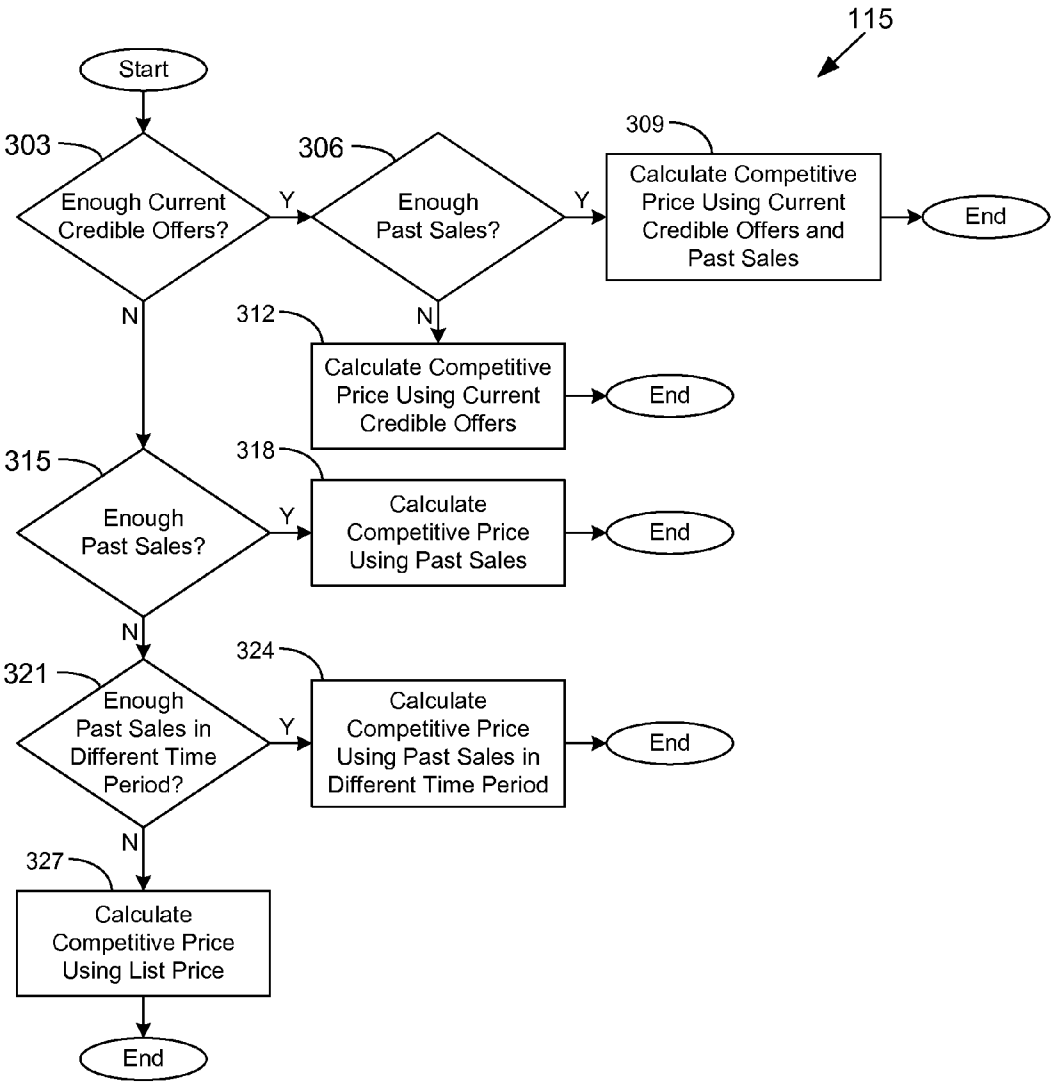

115
Start
303
Enough Current Credible Offers?
Y
306
Enough Past Sales?
Y
309
Calculate Competitive Price Using Current Credible Offers and Past Sales
End
N
N
312
Calculate Competitive Price Using Current Credible Offers
End
315
Enough Past Sales?
Y
318
Calculate Competitive Price Using Past Sales
End
N
321
Enough Past Sales in Different Time Period?
Y
324
Calculate Competitive Price Using Past Sales in Different Time Period
End
N
327
Calculate Competitive Price Using List Price
End

FIG. 3

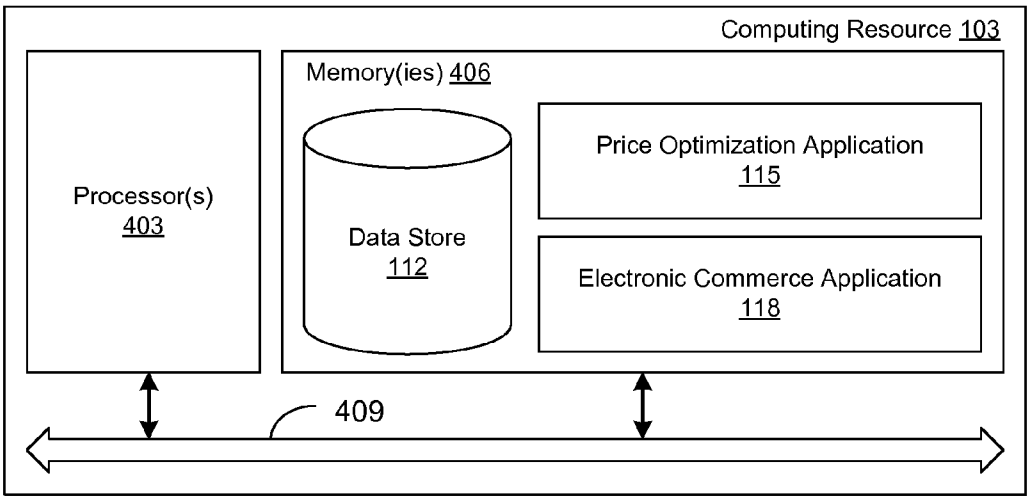

Computing Resource 103
Memory(ies) 406
Processor(s)
403
Data Store
112
Price Optimization Application
115
Electronic Commerce Application
118
409

FIG. 4

PRICE OPTIMIZATION USING CURRENT OFFERS

BACKGROUND

It can be very difficult to determine the fair market value of a product that a company or person wishes to sell. This is because there can be many different factors that bear on the fair market value of a product that can make it difficult to pinpoint the exact value of a product at any given time. For example, if a product has been rendered obsolete by the introduction of a newer version of the same product by a given manufacturer, then the fair market value may drop. Also, unanticipated market forces such as changes in consumer demand in light of popular culture can influence the fair market value at any given time. Because of the difficulty in determining the fair market value of a product at any given time, it is possible for a product to be sold at a price that is too high or too low. When a price is too high, inventory builds up and, correspondingly, the cost of storing inventory increases. When a price is too low, inventory may be depleted and profit is reduced.

BRIEF DESCRIPTION OF THE DRAWINGS

Many aspects of the present disclosure can be better understood with reference to the following drawings. The components in the drawings are not necessarily to scale, emphasis instead being placed upon clearly illustrating the principles of the disclosure. Moreover, in the drawings, like reference numerals designate corresponding parts throughout the several views.

FIG. **1** is a drawing of a networked environment according to various embodiments of the present disclosure.

FIGS. **2** and **3** are flowcharts illustrating examples of functionality implemented as portions of a price optimization application executed in a computing resource in the networked environment of FIG. **1** according to various embodiments of the present disclosure.

FIG. **4** is a schematic block diagram that provides one example illustration of a computing resource employed in the networked environment of FIG. **1** according to various embodiments of the present disclosure.

DETAILED DESCRIPTION

The present disclosure is directed at optimizing prices of items using current offers and other pricing data. As used herein, the term "item" refers to any product, service, digital download, and/or any other type of item that may be purchased at a price. Many factors may be used in assessing the fair market value of an item and generating a competitive price. In one embodiment, when too few current offers that are credible are available, a competitive price for an item may be determined from past sales of the item. In another embodiment, a competitive price for an item may be determined using a blend of past sales of an item with current offers for the item. To provide a comprehensive pricing solution, an item may be priced using, for example, a list price of the item or a percentage relative to a list price of an item when sufficient data regarding past sale prices or current offer prices are not available. In the following discussion, a general description of the system and its components is provided, followed by a discussion of the operation of the same.

With reference to FIG. **1**, shown is a networked environment **100** according to various embodiments. The networked environment **100** includes a computing resource **103** in data communication with one or more clients **106** by way of a network **109**. The network **109** includes, for example, the Internet, intranets, extranets, wide area networks (WANs), local area networks (LANs), wired networks, wireless networks, or other suitable networks, etc., or any combination of two or more such networks.

The computing resource **103** may comprise, for example, a server computer or any other computing device or system providing computing capability. The computing resource **103** may represent multiple computer systems arranged, for example, in one or more server banks or other arrangements. To this end, the computing resource **103** may comprise, for example, a cloud computing resource, a grid computing resource, and/or any other distributed computing arrangement. Such computer systems may be located in a single installation or may be dispersed among many different geographical locations. In one embodiment, the computing resource **103** represents a virtualized computer system executing on one or more physical computing systems. For purposes of convenience, the computing resource **103** is referred to herein in the singular. However, in one embodiment, the computing resource **103** represents a plurality of computer systems arranged as described above.

Various applications and/or other functionality may be executed in the computing resource **103** according to various embodiments. Also, various data is stored in a data store **112** that is accessible to the computing resource **103**. The data store **112** may be representative of a plurality of data stores as can be appreciated. The data stored in the data store **112**, for example, is associated with the operation of the various applications and/or functional entities described below.

The components executed on the computing resource **103**, for example, include a price optimization application **115**, an electronic commerce application **118**, and other applications, services, processes, systems, engines, or functionality not discussed in detail herein. The price optimization application **115** is executed to analyze pricing data from the data store **112** to generate competitive prices for items in a stated item condition or classification.

The electronic commerce application **118** is executed to facilitate the online purchase of items over various networks such as, for example, the Internet or other network as can be appreciated. The electronic commerce application **118** also performs various backend functions associated with the online presence of a merchant and/or an electronic marketplace in order to facilitate the online purchase of items. For example, the electronic commerce application **118** may generate network pages, such as web pages or other types of network content, that are provided to the client **106**. In one embodiment, the electronic commerce application **118** facilitates order origination for each seller in an electronic marketplace.

The data stored in the data store **112** includes, for example, item data **121**, category data **124**, price optimization configuration data **127**, marketplace data **130**, competitor pricing data **133**, and potentially other data. The item data **121** includes various information about items offered for sale through network sites served up through the electronic commerce application **118**. The item data **121** may include, for example, a list price **136**, a price ceiling **139**, a price floor **142**, and potentially other data.

The list price **136** may be, for example, a manufacturer's suggested retail price or some other price which may be established as a reference price for a respective item. The price ceiling **139** may be a maximum price at which the merchant is willing to sell the item. Such a price ceiling **139** may be defined, for example, relative to the list price **136** or

some other price of the item available to the computing resource **103**. The price floor **142** may be the minimum price at which a seller is willing to sell the item. Such a price floor **142** may be, in some embodiments, a liquidation value for the item, or the price that a liquidator is willing to pay the seller for the item.

The category data **124** may contain data related to categories of items. A category may comprise a division of items such as, for example, "books," "electronics," "lawn and garden," "apparel," "music," and so on. The category data **124** may include, for example, normalization parameters **145**, blending parameters **148**, and potentially other data. Although the price ceiling **139** and the price floor **142** are depicted as within the item data **121**, the price ceiling **139** and the price floor **142** may be configured on a per-category basis based at least in part on the category of an item as desired.

The normalization parameters **145** may be used to normalize a condition of an item. In one embodiment, item conditions may include "new," "like new," "very good," "good," "acceptable," and/or other classifications. The normalization parameters **145** include pricing factors in order to transform a price for an item at one of the item conditions to a common condition or classification (i.e., a normalized condition). In one embodiment, item conditions are normalized to the "new" condition. Such normalization parameters **145** may depend on the specific category.

The blending parameters **148** may describe a blending strategy for pricing a particular category. To this end, the blending parameters **148** may weigh, for example, data from past sales versus data from current offers. In various embodiments, the blending parameters **148** may specify blending of various other data in order to arrive at an optimized price for items within the specific category.

The price optimization configuration data **127** may include parameters used in selecting options for optimizing prices. For example, price optimization configuration data **127** may describe post-processing of prices, catalog-wide blending parameters **148**, etc.

The marketplace data **130** includes data that describes an electronic marketplace. The electronic marketplace may comprise one or more network sites wherein multiple sellers offer items for sale. In various embodiments, an electronic marketplace provides a unified interface through which to order items. In one embodiment, the proprietor of the electronic marketplace is the operator of the price optimization application **115**.

The marketplace data **130** may comprise, for example, sales data **151**, offer data **154**, reputational data **157**, and potentially other data. The sales data **151** describes a plurality of past sales for items within the electronic marketplace. The sales data **151** may describe item conditions along with sale prices for each sale. The offer data **154** describes a plurality of current offers to sell items through the electronic marketplace. The offer data **154** may also describe item conditions associated with the offers. The reputational data **157** includes data related to the reputation of a seller in the marketplace. Reputational data **157** may include, for example, customer feedback ratings and/or other reputational data **157**.

The competitor pricing data **133** may include data related to pricing of items by competitors. Such competitors are sellers that are not included within the electronic marketplace. In various embodiments, the competitor pricing data **133** may be more limited than data available within the marketplace data **130**.

The client **106** is representative of a plurality of client devices that may be coupled to the network **109**. The client **106** may comprise, for example, a processor-based system such as a computer system. Such a computer system may be embodied in the form of a desktop computer, a laptop computer, a personal digital assistant, a cellular telephone, set-top box, music players, web pads, tablet computer systems, or other devices with like capability.

The client **106** may be configured to execute various applications such as a browser **160** and/or other applications. The browser **160** may be executed in a client **106**, for example, to access and render network pages, such as web pages, or other network content served up by the computing resource **103** and/or other servers. The client **106** may be configured to execute applications beyond browser **160** such as, for example, email applications, instant message applications, and/or other applications.

Next, a general description of the operation of the various components of the networked environment **100** is provided. To begin, a user at a client **106** accesses a network site served up by the electronic commerce application **118** and orders an item. Such an item may have an item condition classification such as "new," "like new," "very good," "good," "acceptable," and/or other item condition. After the sale is completed, the electronic commerce application **118** records the associated data within the data store **112**, and the sales data **151** is ultimately updated. In this way, the sales data **151** records a plurality of past sale prices for the items.

Additionally, another user at a client **106** may access the electronic commerce application **118** over the network **109** to configure a seller account on the electronic marketplace. Accordingly, offers by this seller on the electronic marketplace may be added, updated, deleted, and/or subject to some other action. Consequently, the offer data **154** may be updated to include the latest current offers for items. Again, each item offered for sale by a seller in the electronic marketplace may be associated with an item condition classification.

The price optimization application **115** may be executed according to a predefined time interval, a command sent by a user over the network **109** from the client **106**, a change in data stored within the data store **112**, and/or in response to some other condition. The price optimization application **115** may optimize the price of one item or any number of items, such as a catalog of items offered by a seller or a proprietor of an electronic marketplace. Although the price optimization application **115** may be executed to determine prices for multiple items and for multiple conditions for a same item, the discussion herein focuses on the determination of a competitive price for a single item at a single condition. It is understood that the discussion herein may be extended to multiple items and multiple conditions for an item.

The price optimization application **115** may determine a strategy for computing a competitive price from data provided in the data store **112**. According to one embodiment, the price optimization application **115** may be configured to blend a price computation based on the offer data **154** with a price computation based on sales data **151**. Such blending may be governed by blending parameters **148** in an associated category from category data **124** or other blending parameters **148** associated with the item or the system.

Blending may be desirable in several situations. As a non-limiting example, basing a price solely on historical sales may result in a price that is too high or too low. As one specific example, in the category of video games, a price determined from historical sales often may be higher than the fair market value because the market for video games is constantly changing due to new releases, obsolescence, and other factors. The offer data **154** may be used exclusively, as a non-limiting example, for an item that is newly released. Also, where insufficient sales data **151** exists for the item, the offer

data **154** may be used instead. By contrast, when there is insufficient offer data **154**, the sales data **151** may be used instead. The sales data **151** may be used exclusively, as a non-limiting example, for an item that has been discontinued.

In one embodiment, the price optimization application **115** may be configured to consider only past sales from the sales data **151** that were made during a predefined time period such as, for example, the last thirty days. However, when insufficient past sales are present in the sales data **151** for the particular item during the predefined time period, the price optimization application **115** may be configured to obtain past sales from the sales data **151** that are older than the predefined time period.

In one embodiment, when neither sufficient sales data **151** nor sufficient offer data **154** are available, the price optimization application **115** may be configured to generate a competitive price for the item using the list price **136** of the item. As a non-limiting example, the price optimization application **115** may set the competitive price for the item to be a percentage of the list price **136**. Such an operation may be governed, for example, through a parameter stored in the price optimization configuration data **127**.

The current offers from the offer data **154** are filtered by the price optimization application **115**. Without filtering, using current offers may result in inaccurate pricing when another seller establishes an offer price far above fair market value or far below fair market value. As a non-limiting example, another seller may price an item at above fair market value when the seller inaccurately believes that the item is worth more than what it would actually command in the marketplace. As another non-limiting example, another seller may price an item at below fair market value when seeking to liquidate the item or to clear a small inventory of the item. Furthermore, setting the price of an item based on current offers by others may make the price vulnerable to arbitrage. For example, another seller may maliciously set a price for an item too high or too low in order to manipulate the price. Such offers may not be legitimate offers.

In one embodiment, the current offers are filtered to exclude offers that exceed the list price **136** associated with the item. In various embodiments, the current offers are filtered by seller using reputational data **157** in order to exclude offers that are not credible by reason of insufficient sales volume, unacceptable customer ratings, and/or other reasons.

Accordingly, the price optimization application **115** may determine offers to sell an item that will be used in determining the competitive price from only a subset of the sellers of an electronic marketplace. The subset of sellers may be selected as those sellers which are associated with a respective reputational score that meets a minimum threshold. For example, the reputational score may meet a minimum threshold when a quantity of customer feedback ratings for the particular seller meets or exceeds a minimum number of customer feedback ratings. Alternatively, or additionally, the reputational score may meet the minimum threshold when the seller has an average customer feedback rating that meets or exceeds a minimum average customer feedback rating. The resulting current offers are considered credible by the price optimization application **115** and may be used in determining the competitive price. In some embodiments, the price optimization application **115** may generate the competitive price also based at least in part on at least one offer by a competitor unassociated with an electronic marketplace.

The price optimization application **115** may process the past sale prices and current offers by transforming them to prices that have been normalized based on item condition. In various embodiments, the past sale prices and the current offers are each associated with an item condition classification. To produce a normalized price, the price optimization application **115** normalizes the given price according to a normalized condition. As a non-limiting example, "new" may be defined as the normalized condition for the items. Accordingly, the price optimization application **115** may apply a pricing factor based on the condition of the item to transform a price to a normalized price. By way of non-limiting examples, the pricing factor for "new" may be 1.00, the pricing factor for "like new" may be 0.95, the pricing factor for "very good" may be 0.90, the pricing factor for "good" may be 0.85, the pricing factor for "acceptable" may be 0.80, and so on. These normalization parameters **145** may be fixed or may vary according to a category associated with the item and/or other factors.

Once the prices from the past sale prices and the current offers have been transformed to normalized prices, then the price optimization application **115** may be configured to determine intermediate results from this data. For example, the price optimization application **115** may generate an average marketplace price from the normalized prices obtained from the current offers. In one embodiment, an average price may be computed for each seller for the items such that multiple instances of the same item sold by a seller may be considered together. Such a result may be weighted as desired. In one embodiment, the result may be weighted according to a reputational score of the respective seller.

Next, the price optimization application **115** is configured to blend the average marketplace price with the average past sale price according to blending parameters **148**. Such a blending operation may take the form of the following equation: $p=\alpha \cdot M+\beta \cdot H$, where p is the resulting price, M is the average marketplace price, H is the average past sale price, and α, β are blending parameters **148**. As a non-limiting example, α may be 0.60 and β may be 0.40, or other values.

The normalized, blended price may then be denormalized for the conditions sought for the item by the price optimization application **115**. For example, the denormalization may involve applying an inverse of a pricing factor associated with a desired item condition. By way of non-limiting examples, the inverse pricing factor for "new" may be 1.00, the pricing factor for "like new" may be 1/0.95, the pricing factor for "very good" may be 1/0.90, the pricing factor for "good" may be 1/0.85, the pricing factor for "acceptable" may be 1/0.80, and so on. In one embodiment, the price optimization application **115** may produce a price denormalized to one item condition, while in another embodiment, the price optimization application **115** may produce prices denormalized to multiple item conditions.

After the competitive price has been denormalized, the price optimization application **115** may be configured to apply further processing to the price. For example, the price optimization application **115** may apply a price ceiling **139** and/or a price floor **142**. In other words, the price optimization application **115** may set the competitive price to a price ceiling **139** associated with the item when the competitive price is above the price ceiling **139**. Likewise, the price optimization application **115** may be configured to set the competitive price to a price floor **142** associated with the item when the competitive price is below the price floor **142**.

Further, the price optimization application **115** may be configured to add a premium to the competitive price according to a seller reputation, or a perceived enhanced service provided by a proprietor or a seller of the electronic marketplace, relative to at least one other seller in the electronic

marketplace. For example, the proprietor or seller may have established goodwill that would allow an increased price to be competitive.

The resulting competitive price may then be stored in the data store **112** as desired. Subsequently, when a client **106** requests a network page from the electronic commerce application **118** containing a price for an item in a specified condition, the electronic commerce application **118** will obtain the competitive price generated by the price optimization application **115**. In one embodiment, the computation of the competitive price is done in real time when it is requested (e.g., when a catalog network page for the item is requested). In another embodiment, the computation of the competitive price may be performed when the item is added to a catalog, a predefined time interval, and/or at other times.

Referring next to FIG. **2**, shown is a flowchart that provides one example of the operation of a portion of the price optimization application **115** according to various embodiments. It is understood that the flowchart of FIG. **2** provides merely an example of the many different types of functional arrangements that may be employed to implement the operation of the portion of the price optimization application **115** as described herein. As an alternative, the flowchart of FIG. **2** may be viewed as depicting an example of steps of a method implemented in the computing resource **103** (FIG. **1**) according to one or more embodiments.

Beginning with box **203**, the price optimization application **115** determines the past sale prices for an item. Such past sale prices may be determined for a predefined time period such as, for example, the last thirty days or some other time period. The past sale prices may be stored, for example, in sales data **151** (FIG. **1**). Next, in box **206**, the price optimization application **115** determines the current credible offer prices for the item. The current credible offer prices are determined from the offer data **154** (FIG. **1**) available from an electronic marketplace including a plurality of other sellers.

The current offers for the item may be filtered for credibility based at least in part on offer prices. As a non-limiting example, the price optimization application **115** may be configured to exclude prices that meet a threshold, such as, for example, prices that exceed the list price **136** (FIG. **1**) of the item or that meet some other threshold. Additionally, current offers may be excluded based at least in part on reputational data **157** (FIG. **1**) associated with the respective seller. As a non-limiting example, the price optimization application **115** may be configured to exclude current offers from a seller not meeting a minimum average customer feedback rating and/or not meeting a minimum number of customer feedback ratings.

In box **209**, the price optimization application **115** normalizes the prices according to a normalized item condition. In other words, each of the past sale prices and current offers are associated with a respective item condition classification such as, for example, "new," "like new," "very good," "good," "acceptable," and/or other conditions. Each of the associated prices is normalized according to a normalized condition such as, for example, "new." The normalization may involve applying a pricing factor from normalization parameters **145** (FIG. **1**) in order to transform the price at a first condition to a price at the normalized condition.

Thereafter, in box **212**, the price optimization application **115** calculates a price for the item in the normalized condition based at least in part on a weighted average of the normalized prices. The price optimization application **115** may calculate, for example, an average marketplace price for the item. Such an average marketplace price for the item may be calculated from an average price for the item for each of the sellers in the marketplace. In one embodiment, such average seller prices may be blended together using a score determined from the reputational data **157** of the respective seller. The average past sale price for the item may be blended with the average marketplace price for the item according to blending parameters **148** (FIG. **1**).

Next, in box **215**, the price optimization application **115** denormalizes the calculated price for an actual condition of an item for which the price is being calculated. Thus, the price optimization application **115** may apply an inverse pricing factor from normalization parameters **145** to transform a price from the normalized condition to the desired condition. As a non-limiting example, if the calculated price has been normalized to the "new" condition, and the desired condition of the item is "very good," the price optimization application **115** will apply a pricing factor to transform the "new" price to a "very good" price for the item according to normalization parameters **145**.

Thereafter, the price optimization application **115** may apply one or more adjustments to the calculated price in order to produce a final competitive price for the item. Accordingly, the price optimization application **115** moves to box **218** and determines whether the calculated price is below a price floor **142** (FIG. **1**) for the item. If the calculated price is below the price floor **142** for the item, the price optimization application **115** moves to box **221** and uses the price floor **142** as the final price. Thereafter, the price optimization application **115** ends.

If instead, in box **218**, the price optimization application **115** determines that the calculated price is not below the price floor **142**, the price optimization application **115** moves to box **224** and determines whether the calculated price exceeds a price ceiling **139** (FIG. **1**) for the item. If, in box **224**, the price optimization application **115** determines that the calculated price exceeds the price ceiling **139**, the price optimization application **115** proceeds to box **227** and uses the price ceiling **139** as the final price for the item. Thereafter, the price optimization application **115** ends. If instead, in box **224**, the price optimization application **115** determines that the calculated price of the item does not exceed the price ceiling **139**, the calculated price is used as the final price for the item and the price optimization application **115** ends.

Turning now to FIG. **3**, shown is a flowchart that provides one example of the operation of another portion of the price optimization application **115** according to various embodiments. It is understood that the flowchart of FIG. **3** provides merely an example of the many different types of functional arrangements that may be employed to implement the operation of the portion of the price optimization application **115** as described herein. As an alternative, the flowchart of FIG. **3** may be viewed as depicting an example of steps of a method implemented in the computing resource **103** (FIG. **1**) according to one or more embodiments. In particular, FIG. **3** further describes selecting pricing data to be used in calculating a competitive price for an item.

Beginning with box **303**, the price optimization application **115** determines whether there are a sufficient number of current credible offers for current offers to be considered in setting an item price. If there are enough current credible offers as determined in box **303**, the price optimization application **115** proceeds to box **306** and determines whether there are a sufficient number of past sales for the past sales to be considered in setting the item price. If, in box **306**, the price optimization application **115** determines that there are enough past sales for past sales to be used, the price optimization application **115** proceeds to box **309** and calculates a

competitive price for the item using both the current credible offers and the past sales. Thereafter, the price optimization application **115** ends.

If instead, in box **306**, the price optimization application **115** determines that there are not enough past sales to be considered, the price optimization application **115** proceeds to box **312** and calculates the competitive price using only the current credible offers and not the past sales. Thereafter, the price optimization application **115** ends.

If, in box **303**, the price optimization application **115** determines that there are not enough current credible offers for the current offers to be considered in setting the price, the price optimization application **115** proceeds to box **315** and determines whether a sufficient number of past sales are present for the past sales to be considered. If, in box **315**, the price optimization application **115** determines that there are enough past sales for the past sales to be considered, the price optimization application **115** moves to box **318** and calculates the competitive price for the item using only the past sales. Thereafter, the price optimization application **115** ends.

If instead, in box **315**, the price optimization application **115** determines that there are not enough past sales for the past sales to be considered, the price optimization application **115** proceeds to box **321** and determines whether there are a sufficient number of past sales in a different time period. If, in box **321**, the price optimization application **115** determines that there are enough past sales in the different time period, the price optimization application **115** moves to box **324** and calculates the competitive price for the item using the past sales from the different time period. The price optimization application **115** then ends.

In box **321**, if the price optimization application **115** determines that there are not enough past sales in the different time period for those past sales to be considered, then the price optimization application **115** moves to box **327** and calculates the competitive price using, for example, the list price **136** (FIG. **1**) for the item or some other price associated with the item. In one embodiment, the competitive price may be determined as a percentage of the list price **136**. Thereafter, the price optimization application **115** ends.

With reference to FIG. **4**, shown is a schematic block diagram of the computing resource **103** according to an embodiment of the present disclosure. The computing resource **103** includes at least one processor circuit, for example, having a processor **403** and a memory **406**, both of which are coupled to a local interface **409**. To this end, the computing resource **103** may comprise, for example, at least one server computer or like device. The local interface **409** may comprise, for example, a data bus with an accompanying address/control bus or other bus structure as can be appreciated.

Stored in the memory **406** are both data and several components that are executable by the processor **403**. In particular, stored in the memory **406** and executable by the processor **403** are the price optimization application **115**, the electronic commerce application **118**, and potentially other applications. Also stored in the memory **406** may be a data store **112** and other data. In addition, an operating system may be stored in the memory **406** and executable by the processor **403**.

It is understood that there may be other applications that are stored in the memory **406** and are executable by the processors **403** as can be appreciated. Where any component discussed herein is implemented in the form of software, any one of a number of programming languages may be employed such as, for example, C, C++, C#, Objective C, Java, Java Script, Perl, PHP, Visual Basic, Python, Ruby, Delphi, Flash, or other programming languages.

A number of software components are stored in the memory **406** and are executable by the processor **403**. In this respect, the term "executable" means a program file that is in a form that can ultimately be run by the processor **403**. Examples of executable programs may be, for example, a compiled program that can be translated into machine code in a format that can be loaded into a random access portion of the memory **406** and run by the processor **403**, source code that may be expressed in proper format such as object code that is capable of being loaded into a random access portion of the memory **406** and executed by the processor **403**, or source code that may be interpreted by another executable program to generate instructions in a random access portion of the memory **406** to be executed by the processor **403**, etc. An executable program may be stored in any portion or component of the memory **406** including, for example, random access memory (RAM), read-only memory (ROM), hard drive, solid-state drive, USB flash drive, memory card, optical disc such as compact disc (CD) or digital versatile disc (DVD), floppy disk, magnetic tape, or other memory components.

The memory **406** is defined herein as including both volatile and nonvolatile memory and data storage components. Volatile components are those that do not retain data values upon loss of power. Nonvolatile components are those that retain data upon a loss of power. Thus, the memory **406** may comprise, for example, random access memory (RAM), read-only memory (ROM), hard disk drives, solid-state drives, USB flash drives, memory cards accessed via a memory card reader, floppy disks accessed via an associated floppy disk drive, optical discs accessed via an optical disc drive, magnetic tapes accessed via an appropriate tape drive, and/or other memory components, or a combination of any two or more of these memory components. In addition, the RAM may comprise, for example, static random access memory (SRAM), dynamic random access memory (DRAM), or magnetic random access memory (MRAM) and other such devices. The ROM may comprise, for example, a programmable read-only memory (PROM), an erasable programmable read-only memory (EPROM), an electrically erasable programmable read-only memory (EEPROM), or other like memory device.

Also, the processor **403** may represent multiple processors **403** and the memory **406** may represent multiple memories **406** that operate in parallel processing circuits, respectively. In such a case, the local interface **409** may be an appropriate network **109** (FIG. **1**) that facilitates communication between any two of the multiple processors **403**, between any processor **403** and any of the memories **406**, or between any two of the memories **406**, etc. The local interface **409** may comprise additional systems designed to coordinate this communication, including, for example, performing load balancing. The processor **403** may be of electrical or of some other available construction.

Although the price optimization application **115**, the electronic commerce application **118**, and other various systems described herein may be embodied in software or code executed by general purpose hardware as discussed above, as an alternative the same may also be embodied in dedicated hardware or a combination of software/general purpose hardware and dedicated hardware. If embodied in dedicated hardware, each can be implemented as a circuit or state machine that employs any one of or a combination of a number of technologies. These technologies may include, but are not limited to, discrete logic circuits having logic gates for implementing various logic functions upon an application of one or more data signals, application specific integrated circuits hav-

ing appropriate logic gates, or other components, etc. Such technologies are generally well known by those skilled in the art and, consequently, are not described in detail herein.

The flowcharts of FIGS. **2** and **3** show the functionality and operation of an implementation of portions of the price optimization application **115**. If embodied in software, each block may represent a module, segment, or portion of code that comprises program instructions to implement the specified logical function(s). The program instructions may be embodied in the form of source code that comprises human-readable statements written in a programming language or machine code that comprises numerical instructions recognizable by a suitable execution system such as a processor **403** in a computer system or other system. The machine code may be converted from the source code, etc. If embodied in hardware, each block may represent a circuit or a number of interconnected circuits to implement the specified logical function(s).

Although the flowcharts of FIGS. **2** and **3** show a specific order of execution, it is understood that the order of execution may differ from that which is depicted. For example, the order of execution of two or more blocks may be scrambled relative to the order shown. Also, two or more blocks shown in succession in FIGS. **2** and **3** may be executed concurrently or with partial concurrence. In addition, any number of counters, state variables, warning semaphores, or messages might be added to the logical flow described herein, for purposes of enhanced utility, accounting, performance measurement, or providing troubleshooting aids, etc. It is understood that all such variations are within the scope of the present disclosure.

Also, any logic or application described herein, including the price optimization application **115**, the electronic commerce application **118**, that comprises software or code can be embodied in any computer-readable medium for use by or in connection with an instruction execution system such as, for example, a processor **403** in a computer system or other system. In this sense, the logic may comprise, for example, statements including instructions and declarations that can be fetched from the computer-readable medium and executed by the instruction execution system. In the context of the present disclosure, a "computer-readable medium" can be any medium that can contain, store, or maintain the logic or application described herein for use by or in connection with the instruction execution system. The computer-readable medium can comprise any one of many physical media such as, for example, electronic, magnetic, optical, electromagnetic, infrared, or semiconductor media. More specific examples of a suitable computer-readable medium would include, but are not limited to, magnetic tapes, magnetic floppy diskettes, magnetic hard drives, memory cards, solid-state drives, USB flash drives, or optical discs. Also, the computer-readable medium may be a random access memory (RAM) including, for example, static random access memory (SRAM) and dynamic random access memory (DRAM), or magnetic random access memory (MRAM). In addition, the computer-readable medium may be a read-only memory (ROM), a programmable read-only memory (PROM), an erasable programmable read-only memory (EPROM), an electrically erasable programmable read-only memory (EEPROM), or other type of memory device.

It should be emphasized that the above-described embodiments of the present disclosure are merely possible examples of implementations set forth for a clear understanding of the principles of the disclosure. Many variations and modifications may be made to the above-described embodiment(s) without departing substantially from the spirit and principles of the disclosure. All such modifications and variations are intended to be included herein within the scope of this disclosure and protected by the following claims.

Therefore, the following is claimed:

1. A non-transitory computer-readable medium storing a program executable in at least one computing device, the program comprising:

code that determines a plurality of current offers to sell an item from a subset of sellers in an electronic marketplace, each one of the subset of sellers being associated with a quantity of customer feedback ratings meeting a minimum quantity threshold and an average customer feedback rating meeting a minimum rating threshold;

code that determines a plurality of past sale prices for the item being ordered through the electronic marketplace during a predefined time period;

code that calculates an average past sale price for the item in a common one of a plurality of predefined item classifications using the past sale prices;

code that calculates an average marketplace price for the item in the common one of the predefined item classifications using the current offers;

code that blends the average past sale price and the average marketplace price to generate a normalized competitive price for the item;

code that converts the normalized competitive price to a competitive price for the item in another one of the predefined item classifications;

code that sets the competitive price to a price ceiling associated with the item when the competitive price is above the price ceiling;

code that sets the competitive price to a price floor associated with the item when the competitive price is below the price floor;

code that does not change the competitive price when the competitive price is not above the price ceiling and when the competitive price is not below the price floor; and

code that offers the item for sale in the specified item condition at the competitive price.

2. The non-transitory computer-readable medium of claim **1**, wherein the code that blends is configured to blend the average past sale price and the average marketplace price based at least in part on a quantity of the past sale prices and a quantity of the current offers.

3. The non-transitory computer-readable medium of claim **1**, wherein the code that determines a plurality of past sale prices for the item being ordered through the electronic marketplace during a predefined time period is further configured to use a different predefined time period in response to determining that a quantity of past sale prices for the item being ordered through the electronic marketplace during the predefined time period does not meet a threshold.

4. A system, comprising:

at least one computing device; and

a price optimization application executable in the at least one computing device, the price optimization application comprising:

logic that determines a plurality of current offers to sell an item from a subset of sellers in an electronic marketplace, each one of the subset of sellers being associated with a respective reputational score that meets a minimum threshold;

logic that determines a respective average seller price for the item from the current offers of each respective one of the subset of sellers;

logic that determines a corresponding seller reputational weight for each respective average seller price based

at least in part on the respective reputational score associated with the respective one of the subset of sellers; and

logic that generates a competitive price for the item based at least in part on an average marketplace price determined by blending the average seller prices according to the corresponding seller reputational weights.

5. The system of claim **4**, wherein the respective reputational score is based at least in part on an average customer feedback rating associated with the one of the subset of sellers.

6. The system of claim **4**, wherein the respective reputational score is based at least in part on a quantity of customer feedback ratings associated with the one of the subset of sellers.

7. The system of claim **4**, wherein each of the current offers is associated with one of a plurality of predefined item classifications, each one of the predefined item classifications indicating an item condition and a pricing factor relative to a common one of the predefined item classifications, the common one of the predefined item classifications being a normalized item classification.

8. The system of claim **7**, wherein the price optimization application further comprises:

logic that normalizes an offer price associated with each one of the current offers by applying the pricing factor associated with the respective one of the predefined item classifications, thereby producing a normalized offer price.

9. The system of claim **8**, wherein the logic that determines the respective average seller price is configured to determine the respective average seller price according to the respective normalized offer prices.

10. The system of claim **8**, wherein the item is associated with one of the predefined item classifications, and the price optimization application further comprises logic that denormalizes the competitive price of the item by applying an inverse of the pricing factor of the one of the predefined item conditions associated with the item.

11. The system of claim **4**, wherein the logic that generates a price for the item further comprises logic that sets the competitive price to a price floor associated with the item in response to determining that the competitive price is below the price floor.

12. The system of claim **4**, wherein the logic that generates a price for the item further comprises logic that sets the competitive price to a price ceiling associated with the item in response to determining that the competitive price is above the price ceiling.

13. The system of claim **4**, wherein the logic that generates a competitive price for the item further comprises logic that adds a premium to the competitive price according to a perceived enhanced service provided by a proprietor of the electronic marketplace relative to at least one other seller of the electronic marketplace.

14. The system of claim **4**, wherein the logic that generates a competitive price for the item further comprises logic that adds a premium to the competitive price according to a reputation of a seller in the electronic marketplace relative to at least one other seller of the electronic marketplace.

15. The system of claim **4**, wherein the logic that generates a competitive price for the item is configured to generate the competitive price based at least in part on a plurality of past sale prices of the item being ordered through the electronic marketplace.

16. The system of claim **15**, wherein each of the past sale prices is associated with one of a plurality of predefined item classifications, each one of the predefined item classifications indicates an item condition and a pricing factor relative to a common one of the predefined item classifications, the common one of the predefined item classifications is a normalized item classification, and the logic that generates a competitive price for the item further comprises logic that normalizes each one of the past sale prices by applying the pricing factor associated with the respective one of the predefined item classifications.

17. The system of claim **4**, wherein the logic that generates a competitive price for the item is configured to generate the competitive price based at least in part on a list price associated with the item.

18. The system of claim **4**, wherein the current offers exclude offers that exceed a list price associated with the item.

19. The system of claim **4**, further comprising an electronic commerce application executable in the at least one computing device, the electronic commerce application comprising logic that facilitates order origination for each one of the subset of sellers in the electronic marketplace.

20. The system of claim **19**, wherein the electronic commerce application further comprises logic that offers the item for sale by a proprietor of the electronic marketplace according to the competitive price generated by the price optimization application.

21. The system of claim **4**, wherein the price optimization application is configured to be executed according to a predefined time interval.

22. A method, comprising the steps of:

determining, in at least one computing device, a plurality of current offers to sell an item from a subset of sellers in an electronic marketplace, the current offers being stored in a memory, each one of the subset of sellers being associated with a respective reputational score that meets a minimum threshold;

determining, in the at least one computing device, a plurality of past sale prices for the item from a plurality of sellers in the electronic marketplace, the past sale prices being stored in the memory;

determining, in the at least one computing device, a respective average seller price for the item from the current offers of each respective one of the subset of sellers;

determining, in the at least one computing device, a corresponding seller reputational weight for each respective average seller price based at least in part on the respective reputational score associated with the respective one of the subset of sellers;

determining, in the at least one computing device, an average marketplace price for the item by blending the average seller prices according to the corresponding seller reputational weights; and

generating, in the at least one computing device, a competitive price for the item based at least in part on the average marketplace price and the past sale prices.

23. The method of claim **22**, further comprising the step of transforming the past sale prices and a price associated with each one of the current offers by applying a respective normalizing factor to convert a price at a first one of a plurality of item classifications to a price at a common one of the item classifications.

24. The method of claim **23**, wherein the respective normalizing factor is predetermined for a category of the item.

25. The method of claim **22**, further comprising the step of generating the respective reputational score based at least in part on a plurality of customer feedback ratings.

26. The method of claim **22**, wherein the step of generating further comprises the step of generating the competitive price based at least in part on at least one offer by a competitor unassociated with the electronic marketplace.

* * * * *